

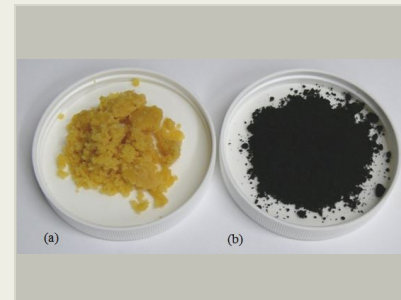
Torrefaction Processing for Human Solid Waste Management, Phase I

Completed Technology Project (2015 - 2015)



Project Introduction

New technology is needed to collect, stabilize, recover useful materials, and store human fecal waste for long duration missions, both for crew safety, comfort and resource requirements and planetary protection. The proposed SBIR Phase I project addresses an innovative torrefaction (mild pyrolysis) processing approach that can be used to sterilize feces, control odor, and produce a stable, free flowing powder that can be easily stored or recycled, while simultaneously recovering all of the moisture, producing additional water, and only small amounts of other gases (CO₂, CO, CH₄) and liquids. The overall objective of the Phase I program is to demonstrate the feasibility of a near full (1/3) scale integrated Waste Collection/Torrefaction (WC/T) unit for fecal waste streams. The Phase I work will be accomplished in three tasks: 1) test unit design and construction; 2) laboratory testing on relevant waste streams; 3) evaluation and preliminary Phase II prototype design. This work plan will address the key questions about the WC/T unit feasibility for the application to human fecal waste and related solid waste streams. In addition, the torrefaction method can be applied using the same or similar conditions to other types of wet or dry cellulosic biomass (food, paper, wipes, clothing) which provides for some desirable redundancy in the waste management system. The Phase II prototype will be compatible with the Universal Waste Management System (UWMS) and complementary to the Heat Melt Compactor (HMC), both now under development by NASA. The torrefaction process can also be accomplished with minimal crew interactions, modest energy requirements and will be able to tolerate mixed or contaminated waste streams.

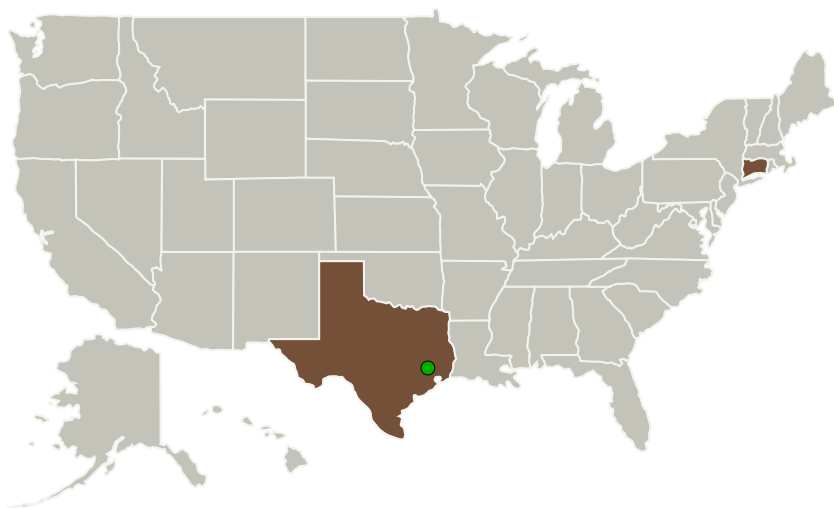


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Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Advanced Fuel Research, Inc.	Lead Organization	Industry	East Hartford, Connecticut
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

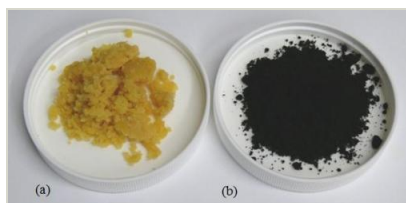
Primary U.S. Work Locations	
Connecticut	Texas

Project Transitions

**June 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Torrefaction Processing for Human Solid Waste Management, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139807>)

Images

**Briefing Chart Image**

Torrefaction Processing for Human Solid Waste Management, Phase I
(<https://techport.nasa.gov/image/128615>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Fuel Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Michael A Serio

Co-Investigator:

Michael Serio

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Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.3 Waste Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System